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The Market for Temperature Sensors in the Americas, 2nd Edition

***Technology Shifts Dominate a Changing Temperature
Sensors Market***

**Thermocouples
RTDs
Thermistors
Infrared Thermometers
Fiber Optic Temperature Sensors
Thermowells**

The temperature sensors market is changing. But how is it changing?

Flow Research has just spent eight months working to answer that question. We began by contacting more than 250 temperature suppliers, and determined which ones are manufacturers of temperature sensors. We then sent each company a detailed questionnaire asking about their products and their company. We then followed up with phone calls, interviewing many of these companies by telephone. In the end, we analyzed all the data we collected and created a complete picture of the market for temperature sensors in the Americas.

This study analyzes the temperature sensors market in the Americas. It includes a technology and product analysis, market share and market size data, and also provides in-depth segmentation of the market by various product and geographic categories. It also includes detailed market growth projections through 2010 for five types of temperature sensors, plus



thermowells. Detailed market strategies are provided for suppliers, and 71 companies are profiled. Data is provided for the Americas, which includes the following geographic regions:

The Americas, including:

United States
Canada
Latin America

This study provides the following vital information about the temperature sensors market:

- Market size in dollars and units for each temperature sensor type
- Growth forecasts through 2010 for each temperature sensor type
- Market shares for each type of temperature sensor
- Detailed product descriptions by supplier
- Growth factors for the temperature sensors market
- Growth forecasts for temperature sensors by industry
- Strategies to employ to compete successfully in the temperature sensors market
- Profiles of 71 suppliers to the temperature sensors market
- Temperature sensor sales by distribution channel
- Temperature sensor sales by customer type

Map courtesy of www.theodora.com/maps, used with permission

Why this study is important to you as a decision-maker in this market

This study is important for many reasons, including the following:

1. The study includes the main types of temperature sensors and accessories:

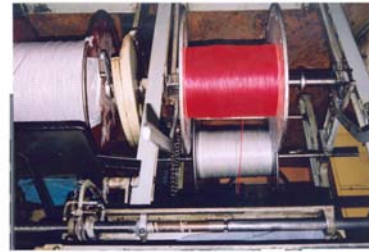
- Thermocouples
- RTDs
- Thermistors
- Infrared thermometers
- Fiber optic temperature sensors
- Thermowells

2. We were able to determine the status of several trends we originally identified in the first edition of this study, published in 2000. Among these are a shift from contact to noncontact temperature sensors, and a shift from wirewound to thin-film RTDs. We now can quantify to what extent new temperature sensor technologies are affecting the market.

3. We determined how much the market has grown in the past six years, including market size in dollars and units. We have this information for each temperature sensor type. This study tells you whether the thermocouple market is growing or declining, and how changes in the thermocouple market compare to changes in the RTD and thermistor markets. With this knowledge, you can better evaluate the prospects for your own temperature sensor products.

4. This 450+ page study provides market shares for the temperature sensors market as a whole, and for each type of temperature sensor. It tells you the major and minor players in each market, and does so by geographic region. Along with this are 71 company profiles that provide detailed financial and product information on most of the suppliers to this market.

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Wakefield, Massachusetts

5. It has been at least several years since a new study of this market has been done. What's more, we believe we are the only market research company currently studying this market. Not only is this new study the result of a thorough examination of the temperature sensors market, we can also see the market in light of the first edition of this study, published in 2000. While some market research firms have neglected the temperature sensors market, we recognize its importance and will continue to research and document this market.

The following describes the temperature sensors included in this study.

Thermocouples. Thermocouples are the most widely used temperature sensor in industrial manufacturing environments. Thermocouples consist of two wires made of different metals that are joined at one end, called the measurement junction. At the other end of the conductors, a reference junction is formed. When the measurement junction and the reference junction have different temperatures, a continuous current flows in the circuit. The resulting voltage is a function of the difference in temperature between the measurement and the reference junctions. The amount of voltage depends on the types of metals used. A voltmeter or other device is required to interpret the voltage reading as a temperature value.

RTDs. Resistance temperature detectors, or RTDs, make use of the fact that resistance to the flow of electricity in a wire changes with temperature. Platinum is the most commonly used material for the wire. There are two types of RTDs: wirewound and thin film. Wirewound RTDs consist of wire wound on a bobbin, which is enclosed in glass or metal. For thin-film RTDs, a film is etched onto a ceramic substrate, and sealed. RTDs are more accurate and stable than thermocouples, but cannot be used to measure extremely high temperatures.

Thermistors. Like RTDs, thermistors also change resistance with changing temperatures, but they are more sensitive than RTDs or thermocouples.

Thermistors change their resistance much more significantly than RTDs with changing temperature. However, this change is highly nonlinear. Because of their extreme sensitivity and non-linearity, thermistors are limited to measuring temperatures of a few hundred degrees Celsius. They are less rugged than RTDs, further limiting their application.

Infrared Thermometers. Infrared thermometers are used to measure temperature when contact measurement, using thermocouples, RTDs, or thermistors, is not possible. For example, they are used to measure the temperature of moving objects, such as moving machinery on a conveyor belt. They are also used where contamination is present, for hazardous reasons, or where the distance is too great for contact sensors. Portable infrared thermometers are used when it is desirable to measure temperature at a distance. Infrared sensors detect the infrared energy given off by materials. The most common design includes a lens to focus the infrared energy onto a detector. The amount of infrared energy is then converted into a temperature measurement according to specifiable units.

Fiber Optic Temperature Sensors. Fiber optic temperature sensors are a noncontact form of temperature measurement that uses optical fibers in making temperature measurements. Most fiber optic temperature sensors work by placing a temperature-sensing component on one tip of the optical fiber. The other end is attached to a measuring system that collects radiation and processes it into a temperature value.

Technology shifts characterize this market

Technology shifts are probably the single most important factor characterizing this market. There is a shift away from contact temperature sensors towards noncontact forms of temperature measurement. Handheld infrared thermometers measure temperature at a distance. Fiber optic temperature sensors, though more expensive, are used to measure temperature in hazardous situations.

Technology shifts are also occurring within the contact temperature sensor market. This study shows how the thermocouple, RTD, and thermistor markets today compare to the markets of 2000. It also allows you to compare the



expected growth rates of these different types of sensors through 2010. It answers the following questions, and many more:

- Is the thermocouple market growing or declining?
- Which types of thermocouples are most often used, J, K, E, N, or other types?
- Which types of RTDs are growing most rapidly in popularity, wirewound or thin film?
- Which are more often used, portable or fixed infrared thermometers?
- What are the fastest-growing industries for temperature sensors and why?
- What geographic region shows the fastest growth rate for temperature sensors?

Market shares of the leading suppliers

Much has changed among suppliers of temperature sensors since the first edition was published in 2000. This study brings you up-to-date on the many ownership changes among temperature sensor suppliers that have occurred in recent years.

Most importantly, this study tells you who are the leading suppliers for each temperature sensor type. Market shares for each sensor type are provided for the United States, Canada, and Latin America. The study reveals two major suppliers of thermocouples and RTDs in Brazil, and another one in Argentina. It also tells you which company dominates the thermocouple and RTD markets in Canada. Of course, the US market is also completely covered, for all types of temperature sensors.

List of companies profiled

This study, with 71 company profiles, has more profiles than any previous Flow Research study. The list of companies profiled includes both traditional suppliers and newer entrants. The profile for each overview, a product description, and a statement of the company's strategy and perspective. This page contains a list of companies profiled.

ABB
 Abbeon Cal
 Acrolab Ltd.
 Alloy Engineering Company, Inc.
 ARI Industries
 Athena Controls
 BetaTHERM Corporation
 Burns Engineering
 Chromalox
 Cleveland Electric Laboratories
 Conax Buffalo Technologies
 Consistec
 Convectorics
 Cooper-Atkins Corporation
 Cornerstone Sensors, Inc.
 CSI International
 C-Temp
 Daily Thermetrics
 Ecil
 Electronic Development Labs
 Emerson Process - Rosemount
 Enercorp Instruments
 Engelhard
 Eurotherm Barber-Colman
 Eustis Pyrocom
 Exergen
 Fiso Technologies
 Furnace Parts
 Gayesco
 GE Sensing
 Harco Laboratories
 Heraeus Holding GmbH

Honeywell Sensing and Controls
 Idaho Laboratories Corp.
 IOPE Precision Instruments
 IPITEK, Inc.
 Ircon, Inc.
 JMS Southeast, Inc.
 JUMO Process Control
 Koenig-Pretempco
 KRL / Bantry Components, Inc.
 Land Instruments International
 Linear Labs
 Luxtron Corporation
 Mac-Weld Machining
 Marlin Manufacturing
 Measurement Specialties
 Mikron Infrared
 Minco Products
 Omega Engineering, Inc
 Pyromation
 Raytek Corporation
 RdF Corporation
 RTD Company
 Sandelius
 Sensor Scientific
 Sensotec
 Smart Sensors Inc.
 Texas Thermowell Industries
 ThermoCoax
 Thermo Electric Co., Inc.
 Thermo-Kinetics Company
 Thermoteknix Systems Ltd.
 United Electric Controls
 U.S. Sensor
 Vulcan Electric
 Watlow
 Weed Instrument
 Wika Instruments, Ltd. / Alltemp
 Williamson Corporation
 YSI, Inc.



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